5-2020

The Effects of Earth-Conscious Art Materials on Early Childhood Montessori Students' Environmental Awareness

Danni Wei

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Submitted on May 8, 2020

in fulfillment of final requirements for the MAED degree

Danni Wei

Saint Catherine University

St. Paul, Minnesota

Advisor: Irene Bornhorst Date: May 8, 2020

Acknowledgements

I want to thank my family and friends for supporting me through this process. I am forever grateful for the head of school for her guidance and generosity and for permitting me to conduct this research at her school. Thank you, Professor Olivia Christensen, for your mentorship. My appreciation also extends to all of my amazing professors, colleagues, and action research coach in the AM2 master's program for this wonderful collective learning experience.

Abstract

This action research project investigates the effect of providing earth-conscious materials in the art curriculum on early childhood Montessori students' environmental awareness. The participants for this study were seven preschool students at a private, home-based Montessori school in the urban Western United States. The research design was qualitative and quantitative, utilizing field notes, observational notes, behavioral tally sheets, and group conversational questionnaires to gather information on students' environmental awareness. The students' mean eco-affinity responses increased by 16%, while their mean environmental awareness responses increased by 23%. The frequency of material usage positively correlated with the frequency of environmental actions. The findings suggest that earth-conscious art materials have a positive effect on student environmental awareness. The researcher realized that increased environmental awareness does not indicate increased ecological stewardship. The conclusion of this study urges educators to reconsider the role that art curriculum and materials play on student environmental awareness.

Keywords: environmental awareness, environmental education, natural materials, earth-conscious, Montessori, visual arts, early childhood, eco-centrism, synthetic materials, ecopsychology, art education

Children are increasingly experiencing symptoms of nature deficit by being more disconnected from nature and the outdoors than previous generations (Larson et al., 2011; Louv, 2005; Tucker, 2006). “Nature-deficit disorder” (NDD) is a popular theory developed by Richard Louv (2005) on why children today are more disconnected from nature and the outdoors than previous generations. Some symptoms of NDD include but are not limited to attention problems, obesity, anxiety, and depression (Larson et al., 2011; Louv, 2005; Tucker, 2006).

As a nature activist and an early childhood educator, I was concerned to learn that students were becoming less interactive with the natural world as they spend more time indoors than before. Since 2018, I had been assisting as a Montessori guide at a cozy, home-based Montessori preschool located in a peaceful neighborhood within a chaotic urban environment. There were seven students in the classroom; ages ranged from 2.5 to 6 years. I noticed that many students were interested in topics involving nature, such as metamorphosis and photosynthesis. They also demonstrated care for the environment through actions like watering plants and telling their classmates to leave bugs alone. However, many students were not aware of their natural surroundings; I observed that students interacted with plastic magnetic tiles, trampolines, and tricycles more often than with plants, animals, and other natural elements while playing outdoors without guidance.

Dickinson (2013) proposed that educators revisit NDD as a symptom, instead of the cause, of the lack of children-nature interactions and further recommended methods that are non-naming, less science-focused, and more emotionally driven. For example, when introducing a new plant, the adult can first ask students questions that drive attention to sensory and emotional experiences before offering the scientific terms (Dickinson, 2013). I am continuing the dialogue by focusing on the earth-conscious art curriculum and materials. By using earth-conscious art

materials (term defined in the following section) in my lessons, the students will be able to explore environmental concepts through artistic methods, allowing them to refine their senses and develop cognitively using materials that reflect the values of the educators.

Research had shown that early childhood interactions with nature significantly increase the probability of developing an eco-centric mindset (Dowdell et al., 2011; Tucker, 2006; Russel, 1999; Rivkin, 1997; Kernan & Divine, 2010). Recent studies indicate that more opportunities to engage with art materials in sensorimotor play can refine children's senses, allow them to engage in active learning about the environment, and benefit their cognitive development (Flowers et al., 2015; Kagan, 2011; Staples, et al., 2019; York, 2014). Studies in early childhood, environmental, Montessori, and art education also point towards a positive change in the ecological attitude of students who interacted with nature-based materials (Bidell, 2017; Chang, 2013; Temiz & Semiz, 2018).

By refining senses and developing cognition while engaging in sensory experiences with more earth-conscious art materials, I predicted that students might be able to develop positive affiliation and curiosity towards the natural environment. Students can refine their tactile, stereognostic, and visual senses by feeling and observing the actual textures, sizes, and color palettes of plants and animals through nature-based art activities (Plevyak & Mayfield, 2010). The refined senses gained from a deeper engagement with the environment may help students appreciate the world around them in a new manner. As environmental concerns grow increasingly more important in modern society, introducing such experiences during early childhood can make a positive impact as children become the future caretakers of the earth. I aimed to conduct this intervention to discover the effects of including earth-conscious art lessons and art materials in the Montessori classroom on children's environmental awareness.

Terms and Definitions

Earth-conscious art materials. "Earth-conscious art materials" throughout this paper includes any object or substance that is biodegradable (all-natural materials) or sustainable (no harm upon ecosystems or the environment). Earth-conscious art materials include (1) *land-sourced materials*, such as water, natural lighting, clay, mud, stone, sand; (2*) responsibly sourced animal/plant-wastes*, such as shells, feathers, water, seeds, flowers, nuts, bark, leaves, berries, seeds, wool; (3) *natural construction materials*, such as felt, twine, paper, natural fabrics, wood (adapted from Whitaker, 2010); and (4) *recycled synthetic materials*, such as unrecyclable plastic.

Eco-centric mindset. According to dictionary.com, eco-centrism is a philosophy that places intrinsic values on all living organisms and their natural environment, regardless of their perceived usefulness or importance to human beings.

Environmental action. Environmental action is a category of the behavioral tally sheet (Appendix A) listing behaviors, which include conversed about plants (CAP), conversed about animals (CAA), conversed about elements (CAE), interacted with plants (IWP), interacted with animals (IWA), and interacted with elements (IWE).

Environmental awareness (EA). EA is a category of group conversational questionnaire (Appendix C) and a positive theme in the observational notes (Appendix B). In the questionnaire, a positive EA mindset means that the subject agrees that plants and animals are important to people and that people need to take better care of nature. In the observational notes, EA includes behaviors such as curious about the environment, aware of recycled materials, and associates positively with the environment.

Environmental engagement (EE). EE is a neutral theme of the observational notes (Appendix B), including behaviors such as roleplay, mental engagement, sensorial engagement, and reusing materials.

Material Usage (MU). MU is the sensorial engagement portion of environmental actions from behavioral tally sheets and environmental engagement (EE) from observational notes, which includes used land-sourced materials, used responsibly sourced animal or plant wastes, used natural construction materials, and used recycled synthetic materials. Even though the recycled materials are synthetic, it is still sustainable. Earth-conscious materials do not mean that all of the materials are natural. Since the recycled synthetic materials are materials that cannot otherwise be recycled, we are not harming the environment in any way and giving the trash materials a new life, or "up-cycling."

Environmental disengagement (ED). ED is a negative theme in the observational notes (Appendix B), including behaviors such as avoiding nature and mistreating the environment.

Montessori work cycle. The Montessori work cycle is usually 2.5 to a three-hour indoor period when students independently and collaboratively work with Montessori jobs.

Eco-art education. This is an integration of visual arts, arts education, and environmental education, which explores and develops environmental awareness and concepts, including issues such as interdependence, biodiversity, and conservancy. Eco-art education provides opportunities for all students to explore environmental activism through artistic means "in pursuit of the higher goal of sustainability" (Inwood, 2013, p.130).

Theoretical Framework

Empiricism suggests that all forms of knowledge are acquired through our experiences (Schunk, 2012). John Locke built on this definition using his term, *tabula rasa*, to address how

human minds are initially a blank slate, slowly acquiring knowledge through sensory experiences and personal awareness (Schunk, 2012). In other words, sensory experiences shape the human mind's mental and emotional development. Montessori's theory of the Absorbent Mind aligns with Empiricism as she stressed the idea that children, which she referred to as "sensorial explorers," from birth to six, effortlessly gain information from their environment through the senses (Montessori, 1967). Sensory experiences are composed of utilizing five basic senses: visual sense, tactile sense, auditory sense, gustatory sense, olfactory sense, and other senses (baric sense, thermic sense, and stereognostic sense) to feel the nine qualities of an object: shape, color, texture, sound, smell, taste, temperature, weight, and size (Lillard, 1972). Repeated learning through authentic sensorial work refines the senses and develops knowledge (Montessori, 1913).

Given the importance of sensorimotor play on children's perception of the world, early childhood educators play an essential role in preparing a classroom environment that will shape children's future mindsets, including their environmental awareness. This claim is backed by studies in environmental education, unveiling a positive correlation between experiences interacting with nature in early childhood and pro-environmental attitudes in adulthood (Dowdell, Gray, & Malone, 2011; Kernan & Divine, 2010; Russel, 1999; Rivkin, 1997; Tucker, 2006). The correlation confirms the theory of Empiricism and Absorbent Mind that sensory experiences during early childhood shape attitudes and knowledge in adulthood.

Through the lens of Empiricism, I developed an art intervention aiming to involve my Montessori Pre-K students (ages 2.5 to 6) in sensorimotor play with earth-conscious materials, while aiding them in the recognition and categorization of the natural world. My prediction was that by engaging in sensory experiences with earth-conscious materials, students might be able to

grasp the qualities of natural materials better and develop positive affiliation and curiosity towards the natural environment.

Literature Review

One hundred years ago, Dr. Maria Montessori felt that modern societies contradicted and undervalued the importance of nature (Crain, 2000). When she recognized that children from urban environments lacked the connection with nature, she brought nature to them by including natural objects—for example, animals, rocks, and plants—into the classroom environment (Crain, 2000). "Nature deficit disorder" (NDD), a term coined by Louv (2005) used to describe mainly children losing contact with the natural environment, is becoming a widespread concern as society moves quickly towards urbanization (Larson et al., 2011). Some effects of NDD included dulled senses, behavioral challenges, obesity, stress, decreased academic performance, and lower emotional and physical well-being (Louv, 2005).

A critique of prescribing increased nature interactions to nature-deficit children is that NDD is a misdiagnosis. One such critique is from Dickinson (2013), who acknowledged the problem of the child-nature disconnect but recognized that the lack of interactions with nature is not the cause but the symptom. Dickinson pushed the question: Why do some humans choose to disconnect themselves with nature? Before placing children in nature, adults need to first reconsider their relationship psychosocially and culturally (Dickinson, 2013). Although prescribing more earth-conscious materials may help alleviate the issue of children's apathy to the natural world, it takes more to rid the problem of natural deficit completely. Dickinson (2013) suggested methods that are non-naming, less science-focused, and more emotional—all characteristics of an earth-conscious art curriculum. When introducing children to a new plant,

the adult can first ask children open-ended questions that drive attention to sensory and emotional experiences before offering the scientific terms (Dickinson, 2013).

The Montessori visual arts curriculum primarily focuses on experimenting with materials or replicating educators' or master's works (Kibbey, 1977; Horvath et al., 2016). Research has demonstrated that rich visual arts experiences go beyond merely replicating model artworks (Bresler, 1993; Eckhoff, 2008; Ji-Hi Bae, 2004; Yohlin, 2012). Art is not necessarily utilitarian, but early personal experiences with environmental art may have the capability to mold young minds to be more nature-minded. Sensory exploration and artistic expression are beneficiary to one another. Art activities can train children's observation skills and allow them to experience the qualities of materials through self-motivated creations. By touching a tree bark, leaves, rocks, flowers, and soil, children gain access to the wealth of information within the environment (Plevyak & Mayfield, 2010), which they can use to create art more efficiently.

According to Montessori (1967), "The hands are the instrument of the human intellect" (p.38). By working with their hands to create art out of natural materials, children can refine their tactile, stereognostic, and visual senses by feeling and observing the actual textures, sizes, and color palettes of plants and animals through nature-based art activities (Plevyak & Mayfield, 2010). The refined senses gained from the environment help children appreciate the world around them, and environmental art is an interactive method to do so. Research has shown that early childhood interactions with nature significantly increase the probability of developing an eco-centric mindset (Dowdell et al., 2011; Tucker, 2006; Russel, 1999; Rivkin, 1997; Kernan & Divine, 2010). Keeping these benefits in mind, this review of literature examines scholarly work involving visual art activities in Montessori Education, Early Childhood Education, and Environmental Education.

Synthetic Versus Natural Art Materials

A number of studies focused on the effects of switching from synthetic to natural art materials on the subjects' mentality (Chang, 2013; Temiz & Semiz, 2018). Chang's (2013) study involved nine urban adult clients of art therapy. After the study introduced natural art materials, participants were asked to describe their work or school life. Surprisingly, all the participants ignored the instructions and focused instead on their early childhood memories and personal experiences involving nature. The urban adults in this study reflected on their childhood experiences as a way of self-healing, after feeling a nature-disconnect due to school and work (Chang, 2013).

Another study, conducted in a practicum school in Anatolia, Turkey, required eight pre-service teachers to organize nature-based art activities for four and five-year-old preschool children (Temiz & Semiz, 2018). By implementing art activities with natural art materials instead of synthetic art materials, Temiz and Semiz found an increase in children's curiosity and interest in nature. While this study is informative and contemporary, the results focused on the pre-service teachers instead of the students. There is a lack of primary sourced data assessing how switching to earth-conscious art materials affects the mentality of children.

According to Aguirre-Bielschowsky, Freeman, and Vass (2012), personal experiences, cultural context, and a school's environmental practices significantly influence children's perceptions of the natural environment. Natural art materials utilized in Temiz and Semiz's (2018) study included chicken bones and sunflower seeds, which are interesting choices that might not be acceptable in other cultural contexts.

In Chang's (2013) study, beyond the participant's intake answers, there were significant differences between the artworks with synthetic materials and natural materials. Chang (2013)

observed that the artworks with artificial materials seemed more scattered on paper, while the artwork with natural materials seemed brighter and more organized. Similarly, Temiz and Semiz's (2018) study indicated that switching to natural art materials increased participant's, in this case—children's potential for creativity. Both Chang's (2013) and Temiz and Semiz's (2018) studies suggested that between the two types of materials, natural art materials lead to deeper connections with nature. Since I was only able to find two supporting studies, I explored this topic further through my research.

Montessori and Environmental Awareness

Dr. Montessori was concerned with fostering the child's respect and appreciation of their global and personal environment, especially during early childhood years. In Montessori's words,

> But nevertheless [humankind] still belongs to nature, and, especially when he is a child, he must needs draw from it the forces necessary to the development of the body and of the spirit. We have intimate communications with nature which have an influence, even a material influence, on the growth of the body. (Montessori, 1912, p. 123).

Because of her belief that the child requires exposure to nature (Montessori, 1964), Dr. Montessori would advocate the usage of natural materials inside the classroom environment as educational resources (Kibbey, 1977). Montessori saw the sensorial and emotional benefits nature had on children in the sense that natural settings effectively stimulate a child's observational skills (Crain, 2000). For instance, when taking a stroll with a child, one would notice that the child will persistently pause to observe "a brook, animal, or fallen branch for long stretches of time, completely absorbed in quiet contemplation" (Crain, 2000, p. 70).

Dr. Montessori also witnessed that observations of an animal or a flower can lead the child to develop a love of life (Crain, 2000). Although Montessori did not record a precise age

for the child's sensitive period for nature (Crain, 2000), she did propose that the child's heightened senses allow them to experience nature in ways the adult cannot (Montessori, 1967). "Sensitive period" is a term used by Montessori (1949), used to describe a critical time when the child is especially reactive to a particular stimulus or type of interaction. A recent study located in a Montessori toddler classroom in France revealed that the more days a Montessori toddler participated in the nature-based lessons and activities, the more eco-centric development they achieved (Bidell, 2017). When the students were asked what they like to do outside, the pre-survey responses demonstrated confusions. The students' post-survey responses after four weeks indeed were much more responsive and specific, and full-time students demonstrated more growth than part-time students. By the end of the study, the children's interests in natural materials and their desire to help protect nature increased (Bidell, 2017).

Although Dr. Montessori did not develop any particular art curriculum, she did value art in the development of young children. Dr. Montessori gave insights into the role of art in early childhood stating that art is an accessible form of expression for the young child, and she encouraged the exploration of new art materials and techniques (Montessori, 1976). Moreover, Dr. Montessori (1976) suggested that the art curriculum should aim to refine senses and observation skills. Natural materials incorporated in children's art products provide opportunities for discussing how the materials' color and shape transform with time (Efthymia et al., 2012; Solberg, 2016; Temiz & Semiz, 2018) which will enhance the child's observational skills and conversational skills. In addition, nature-based art involves phenomena like movement, light, and decay in time and space. For example, as a child utilizes a leaf as their art material, they get the opportunity to observe the withering of the leaf as the visuals and textures of their work transform with time. In other words, earth-conscious art materials provide the chance for

children to explore scientific and environmental concepts, which addresses the issue of child-nature alienation (Temiz & Semiz, 2018).

It is necessary for teacher education programs to initially include courses connecting both art and environment curricula, such as land art, trash art, and recycle art (Efthymia et al., 2012). An action research project (Tarr, 2008) focused on implementing environmental education into music and movement, storytelling, visual arts, and handwork workshops for early childhood professionals. In the visual arts workshops, professionals learned traditional visual art methods as a means for developing observation skills in children regarding their environment. Professional participants claimed that children were able to socially reflect their environmental knowledge through artistic means. Tarr's (2008) project demonstrated that art-based pedagogies were effective in teaching young children about the natural world and greatly benefited both children and childcare professionals by developing children's environmental observation skills and knowledge.

Environmental Education

Art education and environmental education are both valuable tools that can help increase the child's power of observation and sensorial refinement (Inwood, 2003; Inwood, 2010; Montessori, 1976; Tarr, 2008; Temiz & Semiz, 2018). When the two curriculums are fused, the child can become significantly more aware of their natural environmental surroundings and develop a decisive role in sustainability (Inwood, 2003; Inwood, 2010; Flowers et al., 2015).

The environmental education curriculum emphasizes the concept that harmonious coexistence requires caring for one another, which promotes the child to be a planetary caretaker (Belz, 2011; Doran, 2002; Segalla et al., 2013). Environmental education equipped with earth-conscious art materials becomes eco-art education, which further develops the environmental

concept that all components of the universe are interdependent (Inwood, 2013). This concept complements Montessori peace and cosmic education. Peace and cosmic education communicate to the child the interconnectedness of all forms of life, including the child (Lillard, 2005). Eco-art education can communicate to the child that their educators and school care about the environment by incorporating the idea of sustainability in their education (Inwood, 2010). According to Doran (2002), "schools reflect societies and societies reflect schools" (p. 40). With this quote in mind, if the goal is to promote children to be future caretakers of the environment, then the first step is to take a look at the materials, including art materials, educators present to them. What do the art materials say about the educators' position on protecting the environment?

In recent art education and environmental education research, there is a growing number of studies in environmental education, exploring the role visual arts play on cognitive and ecological thinking (Flowers, 2012; Flowers et al., 2015; Kagan, 2011; Staples et al., 2019; York, 2014). A quantitative study made an effort to incorporate artistic methods into assessing environmental attitudes and awareness of young children (Flowers et al., 2015). The researchers' art assessment was an adaptation of a drawing prompt and corresponded to a grading rubric used to assess the environmental attitudes and awareness of 285 children. The study concluded that art-based assessments, encouraging creativity, and accommodating different modes of expression, is a practical and unique learner-centered tool for measuring distinct components of environmental attitudes and awareness. Gablik (1991) claimed that the merging of the arts and environmental education challenges how students react to nature. The marriage forges new opportunities to develop ecological identities and eco-centric mindsets. The recent efforts

demonstrated that visual arts “represent a key form of communication, allowing children to freely express ideas they are sometimes unable to express verbally” (Flowers et al., 2015, p. 3).

Reduce, Re-use, Recycle as Art

Researchers revealed that early childhood experiences with nature have a direct correlation with one's environmental conservancy practices and attitudes in adulthood (Ärlemalm–Hagsér, 2013; Chawla, 2007; Chawla & Cushing, 2007; Peterson, 1982; Tanner, 1980). Natural materials invite "children to observe how waste materials turn into aesthetic beauty" (Temiz & Semiz, 2018, p. 568), but introducing concepts of re-using synthetic materials to young learners share a similar goal. Teachers, described in Belz's (2011) article, incorporated the environmental concept of re-use in activities with their young students, such as "taking a walk around the schoolyard or the block to look for trash" (p. 36). The children and teachers gathered earth-conscious objects outdoors to create collages and other art forms. This activity enabled children and teachers to learn about their neighborhood as well as environmental concepts (Belz, 2011). Although anecdotes, such as this one, hint at the beneficial results of introducing concepts of re-use, there is still a lack of research on how recycled art materials affect children's environmental stewardship.

Conclusion

There is an increasing trend in studying the role visual arts play on people’s environmental awareness (Flowers, 2012; Flowers et al., 2015; Inwood, 2003; Inwood, 2010; Kagan, 2011; Staples, Larson et al,, 2019; York, 2014). The studies in early childhood education, environmental education, Montessori education, and art education point towards a positive change in recipients’ ecological attitude who interacted with nature-based materials (Bidell, 2017; Chang, 2013; Temiz & Semiz, 2018). There is conclusive data on how early childhood

interactions with nature correlates to positive environmental attitudes in adulthood (Ärlemalm–Hagsér, 2013; Tanner, 1980; Peterson, 1982; Chawla, 2007; Chawla & Cushing, 2007). However, the data is lacking in primary Montessori children's involvement with nature-based art. Overall, art-based research in Montessori Education is also lacking even though art-based research in education is gaining more momentum in the recent years (Cahnmann-Taylor & Siegesmund, 2018; Staples, 2019). The existing data analysis and literature review (Kibbey, 1977; Bidell, 2017) only scrape the surface on the topic. It was also challenging to locate existing studies on how recycled materials affect children's environmental stewardship. Only a couple of testimonials are provided within a few scarce resources (Belz, 2011).

Nature-based education implemented at school can help expose young children to the natural world and allow them to develop lifelong respect for nature. Environmentally-friendly materials provide more opportunities for children to engage with nature and communicate to children that the school and society care about the environment.

There is insufficient evidence to conclude that re-using human-made materials in art activities communicates environmental awareness. Research has shown that early childhood interactions with nature influence the probability of developing an eco-centric mindset (Dowdell et al., 2011; Tucker, 2006; Russel, 1999; Rivkin, 1997; Kernan & Divine, 2010). However, further research is needed on how using earth-conscious art materials can affect Montessori children's environmental awareness.

Methodology

The study utilized an action research intervention to determine the effects of providing earth-conscious visual art curriculum and materials on students' environmental awareness. For this action research study, the population was preschool Montessori students (2.5 to 6-years-old)

of a private, home-based Montessori school located in an urban setting of the Western United States. The study was conducted in early 2020 with a total sample size of seven. The students included three boys and four girls, consisting of two first-year preschool students, three second-year preschool students, two third-year preschoolers.

Their interactions with the earth-conscious art materials and behaviors involving nature were recorded using several data tools. Qualitative measurements consisted of field notes and observation notes (Appendix B). Quantitative measurements included group conversational questionnaire (Adapted from Flowers, 2012) (Appendix C) and behavioral tally sheets (Appendix A).

The intervention involved introducing earth-conscious (natural and recycled) art materials as sensorimotor creative play. As a general procedure, the researcher administered group conversational questionnaires before the weekly earth-conscious art group time discussions on Tuesdays. Some environmental artists from land art and eco-art movements were shared during group time. The researcher then introduced three earth-conscious art materials per class, and the class discussed the origins of the materials, the role they play in the environment, and how to use them to create art safely. The materials were then provided on art shelves or in the outdoor area for children to access throughout the six-week duration of the intervention. Students had access to the materials during their Montessori work cycle and free play.

In the first week, the researcher introduced several environmental artists: (1) Richard Smithson, (2) Andy Goldsworthy, and (3) Richard and Judith Lang. Students were shown images of the artists' works and asked to identify materials used by the environmental artists listed above. The researcher also asked students to bring clean materials to class that they would

typically throw away and place them in the donation box. A tray containing pieces of paper was on the art shelf for students to create collages.

In Week 2, during group time, the class reviewed the artists Richard and Judith Lang, and the students took turns using recycled plastic, recycled paper, and glue to construct eco-art sculptures collaboratively. The researcher demonstrated how to make glue for paper mâché using flour and water, and the construction of the recycled structures continued daily during outdoor time.

In Week 3, the class reviewed works by Robert Smithson, and the researcher added three materials: rocks, sand, and twigs, to the list of earth-conscious art materials. The researcher demonstrated how to work with the Earth Tray, which is a job similar to a tabletop Zen garden. The difference is that all materials on the Earth Tray were found on the local beach. Students were encouraged to create their own designs by using twigs to draw lines in the sand and placing rocks to make mini sculptures. That week, the class, and a few parent volunteers went on a nature walk and collected natural materials from around the neighborhood. Students were instructed to gather twigs, leaves, flowers, and seeds from the ground, not from plants, to encourage environmental stewardship.

During Week 4, the group time took place outdoor, and the class reviewed works by Andy Goldsworthy. The researcher introduced three materials that were found on their nature walk last week. All originated from plants: leaves, seeds, and flowers. The class had a discussion on what they can do to help plants grow, and the researcher made a design with the materials on the ground with the new materials and invited students individually to add to the design. During outdoor time, students, with the help of the researcher, made mobiles with the plant materials collected from the nature walk.

Materials introduced in Week 5 consisted of responsibly sourced animal wastes: shells, feathers, and wool. The class discussed ways to help animals, and the researcher presented a tray with feathers and shells for students to make collages. Throughout the week during outdoor time, students had access to the three new materials as well.

During Week 6, the researcher reviewed works by Richard and Judith Lang, Robert Smithson, and Andy Goldsworthy, and the students created designs and individual sculptures using any of the earth-conscious materials introduced in the past weeks. A concise weekly breakdown of the intervention's lesson plan can be found in Appendix D.

The researcher recorded the individual students' nature and recycling-related behaviors, events, and conversations weekly using observational notes (Appendix B), which captured specific events pointing to changes in students' environmental engagement (EE), environmental awareness (EA), and environmental disengagement (ED). The researcher circled appropriate behavior categories at the bottom of the form to distinguish the student's areas of interest. It is assumed that behaviors signaled areas of student interest. The observations took place from around 9:00 a.m. to noon for 15 minutes for individual students one time per week. Monday, February 17th, 2020, was missed due to President's Day, and Wednesday, February 19th, 2020, was missed due to the researcher having to attend Jury Duty Service. The observational notes were coded and categorized to reveal the effects of the intervention.

Field notes were also collected throughout the six-week duration of the action research project. Behaviors and conversations involving nature and protecting the environment were recorded by the researcher in a notebook. Field notes provided immediate qualitative data on how students were responding to the art lessons. By using coding and categorizing codes, the

researcher revealed any behavioral patterns throughout the intervention and utilized this data to answer the question of how the intervention is affecting students' environmental awareness.

The group conversational questionnaire (see Appendix C) was administered at the beginning of "Lesson 1" of the weekly intervention session during circle time. Students were asked to show if they agreed, disagreed, or were unsure about several statements. These four statements were (1) "I like to learn about ways to help nature," (2) "I like to learn a lot about plants and animals," (3) "Plants and animals are important to people," and (4) "People need to take much better care of nature." The researcher instructed students to give a thumbs up if they agreed with the statement, give a thumbs down if they disagreed, and shake their heads if they were not sure. They were told that there were no right or wrong answers. Group conversational questionnaires were analyzed by categorizing the statements by eco-affinity (natural liking for the environment), environmental awareness, and artistic attitudes. The responses to the questions in each category were then averaged. The number of students present was recorded at the time of the conversational data collection.

The researcher carried a clipboard with forms and a small note pad at all times. The behavioral tally sheets (see Appendix A) were filled either from 9:00 a.m. to 11:30 a.m. or from 9:30 a.m. to noon. The tally sheets helped answer the question of whether or not students are increasing their involvement with nature as they work with the earth-conscious art materials, and the group conversational data gathering tool will provide quantitative data of the students' environmental awareness and attitudes towards the intervention. The tally sheet also allowed the researcher to record the frequency of behaviors relating to the environment, which helped reveal patterns on how the intervention is affecting the students' environmental awareness. The

behavioral tally sheet is separated by student environmental actions and the usage of earth-conscious art materials.

Analysis of Data

The purpose of this study was to determine the effects of earth-conscious art curriculum and materials on Montessori preschool students' environmental awareness. An increase in behaviors, such as communicating about and interacting with nature and earth-conscious art materials, indicated that the children were expanding their environmental awareness. The research design was qualitative and quantitative, utilizing field notes, observational notes, behavioral tally sheets, and group conversational questionnaires to gather information on students' environmental awareness.

The subjects for this action research study were preschool Montessori students (2.5 to 6-years-old) of a private, home-based Montessori school in an urban setting of the Western United States. Seven students participated in the study, of which three were boys, and four were girls. The adults in the classroom consisted of one lead teacher, one assistant teacher, and the researcher.

The group conversational questionnaires focused on eco-affinity, environmental awareness, and artistic attitude, and were collected for each individual child through researcher-initiated group discussion (Appendix C). Additional data was collected daily throughout the week over the course of the intervention using behavioral tally sheets (Appendix A), observational notes (Appendix B), and field notes. These tools recorded behaviors relating to the natural environment and earth-conscious art materials.

Quantitative Component: Group Conversational Questionnaires

The analysis of data included both qualitative and quantitative methods. Group conversational questionnaires were analyzed by categorizing the responses by eco-affinity (natural liking for the environment), environmental awareness, and artistic attitudes, followed by averaging the responses for the questions in each category.

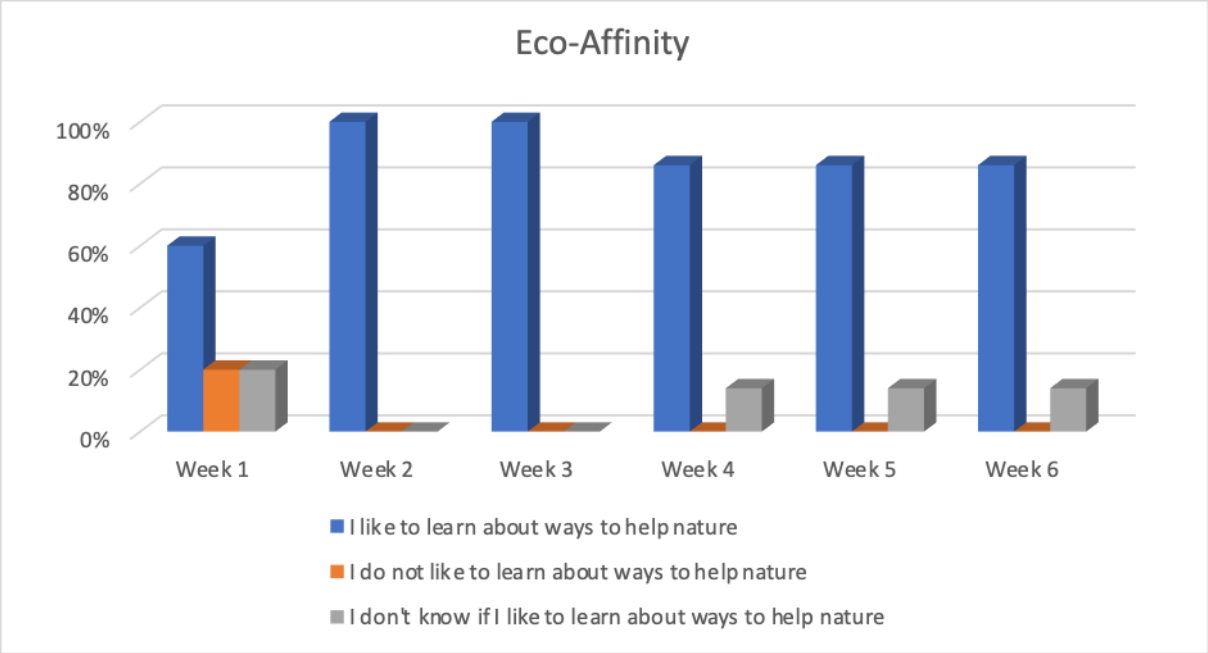

Figure 1. Students' responses in the category of eco-affinity yielded from the group conversational questionnaires (Appendix C).

Figure 1, configured from group conversational questionnaire responses (Appendix C), indicates that from Week 1 to Week 2, the percentage of students who agreed that they liked to learn about ways to help nature increased by 40%, while the students who disagreed or were uncertain about whether or not they wished to learn about ways to help nature dropped to 0%. The responses remain the same from Week 2 and Week 3. However, the percentage of students who demonstrated eco-affinity decreased in Week 4 by 14%, while the percentage of students

who were unsure about their eco-affinity position slightly increased by 14%. These results stayed constant from Week 4 to Week 6.

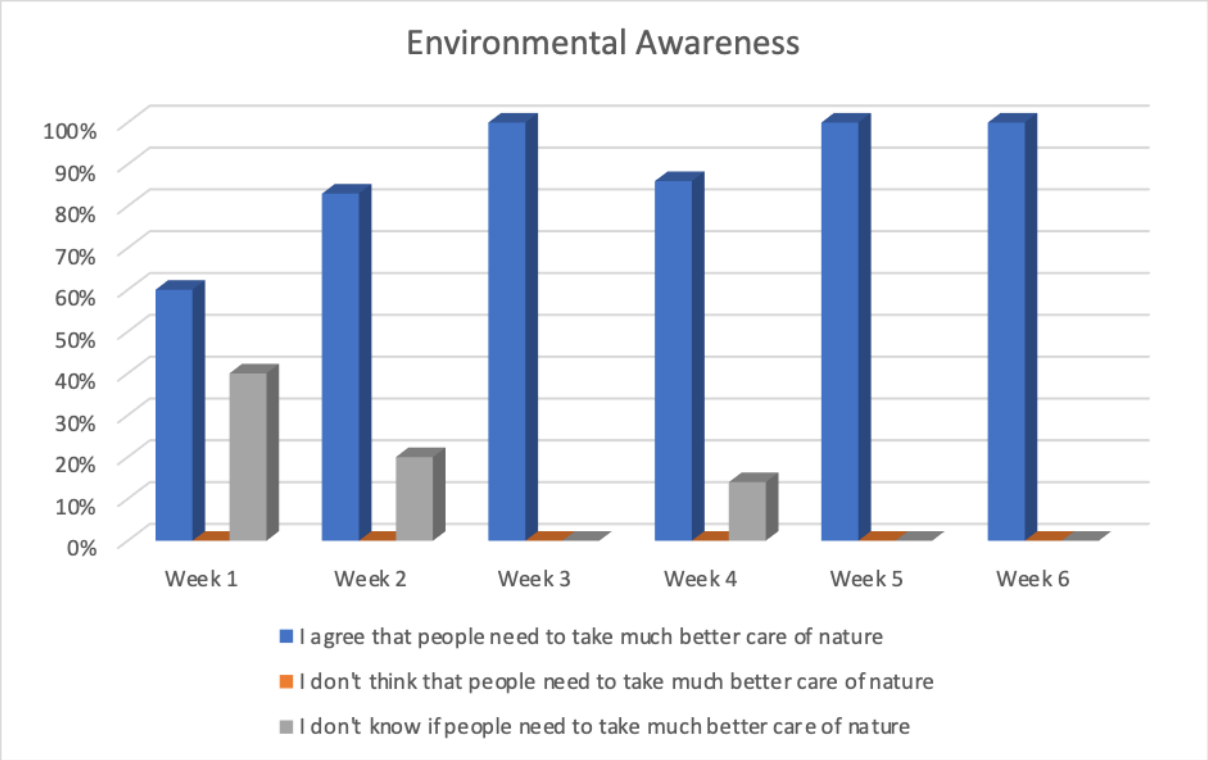

Figure 2. Students' responses in the category of environmental awareness yielded from the group conversational questionnaires (Appendix C).

As Figure 1 illustrates an overall increase in student's eco-affinity, Figure 2 also demonstrates an increase in students' environmental awareness. Students who agreed that people need to take much better care of nature steadily increased from Week 1 to Week 3. There was some variability from Week 3 to Week 5 before reaching a consistent unanimous agreement on their votes.

Table 1

Pre-/Post-Intervention Changes in Class Percentages within Questionnaire Categories

	Pre-Intervention	*Post-Intervention*	*Change*
Eco-Affinity			
I like to learn a lot about plants and animals	80%	86%	+6%
I like to learn about ways to help nature	60%	86%	+26%
Avg. Eco-Affinity %	70%	86%	**+16%**
Environmental Awareness			
Plants and animals are important to people	80%	86%	+6%
People need to take much better care of nature	60%	100%	+40%
Avg. Environmental Awareness %	70%	93%	**+23%**

Note: Average categorical changes in percentage are bolded.

Table 1 compares the average percentage of responses in the group conversational questionnaire categories of eco-affinity and environmental awareness. The category of eco-affinity consists of two statements: “I like to learn a lot about plants and animals,” and “I like to learn about ways to help nature.” The category of environmental awareness consists of two statements: “Plants and animals are important to people,” and “People need to take much better care of nature.” Table 2 demonstrated that students’ average positive eco-affinity responses increased by 16%, while their mean positive environmental awareness responses increased by 23%. The statement that yielded the most increase in positive responses was, “People need to take much better care of nature.”

The third category of the group conversational questionnaire, artistic attitude, was not included in Table 2 due to the lack of data in Week 1. Since we have not been introducing earth-conscious art materials during group time, the conversational topics were not appropriate at the time.

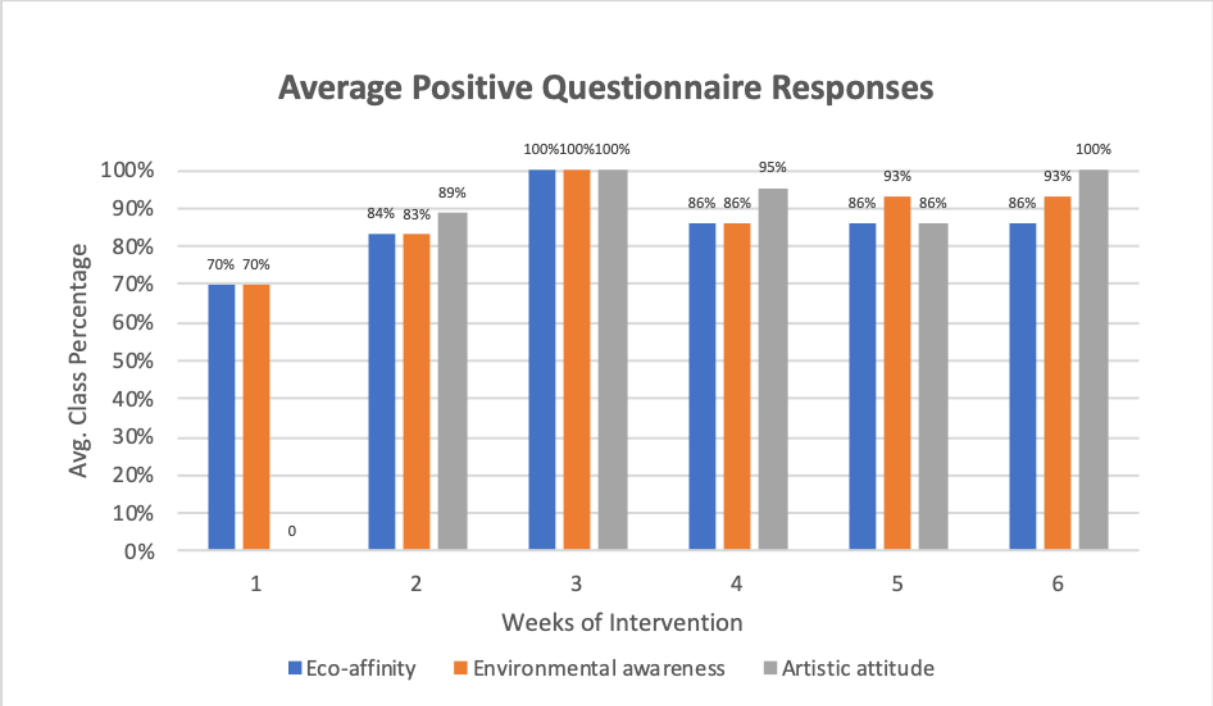

Figure 3. A comparison of average percentage of positive responses from group conversational questionnaires (see Appendix C).

The average positive responses from the questionnaire's three categories, when measured side-by-side (see Figure 3), revealed a close correlation from Week 1 to Week 3 and varied slightly from Week 4 to Week 6. Eco-affinity average positive responses represent a bell-curve that stabilizes at 86% in the final three weeks. On the other hand, average positive responses in artistic attitude fluctuate, declining by 11% in Week 5 and rising by 14% in Week 6. Moreover, Figure 4 shows that students who liked to learn about ways to help nature increased by 26% after the intervention took place, and students who did not like to learn about ways to help nature

noticeably dropped to 0% post-intervention. Students who were unsure of their position also slightly decrease from 20% to 14%.

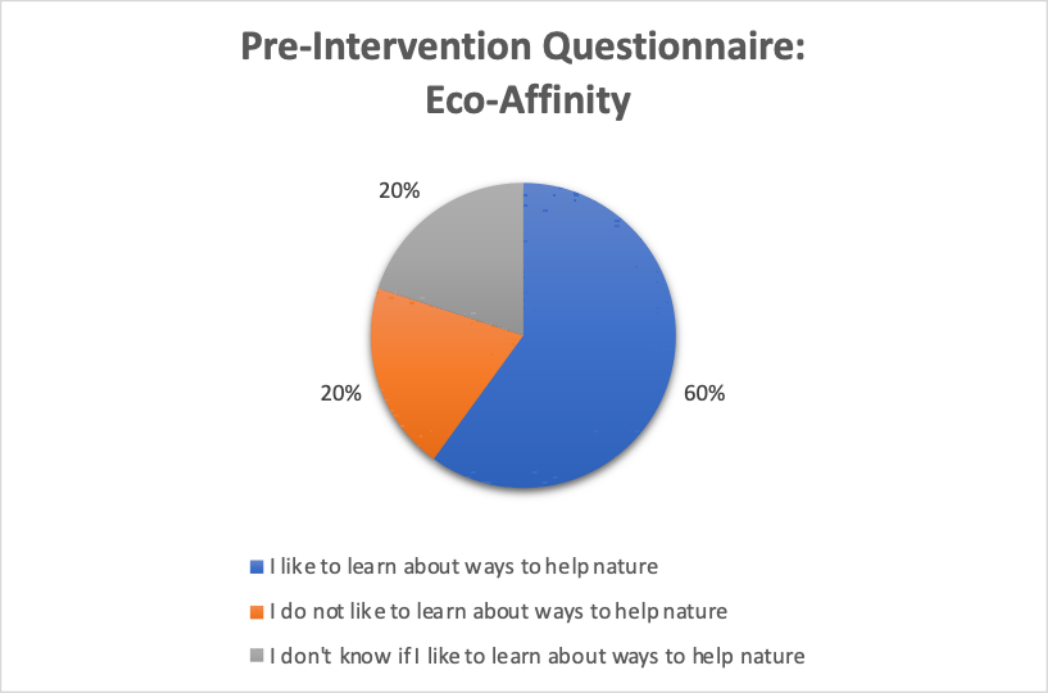

Figure 4. Pre-Intervention Questionnaire Responses: Eco-Affinity

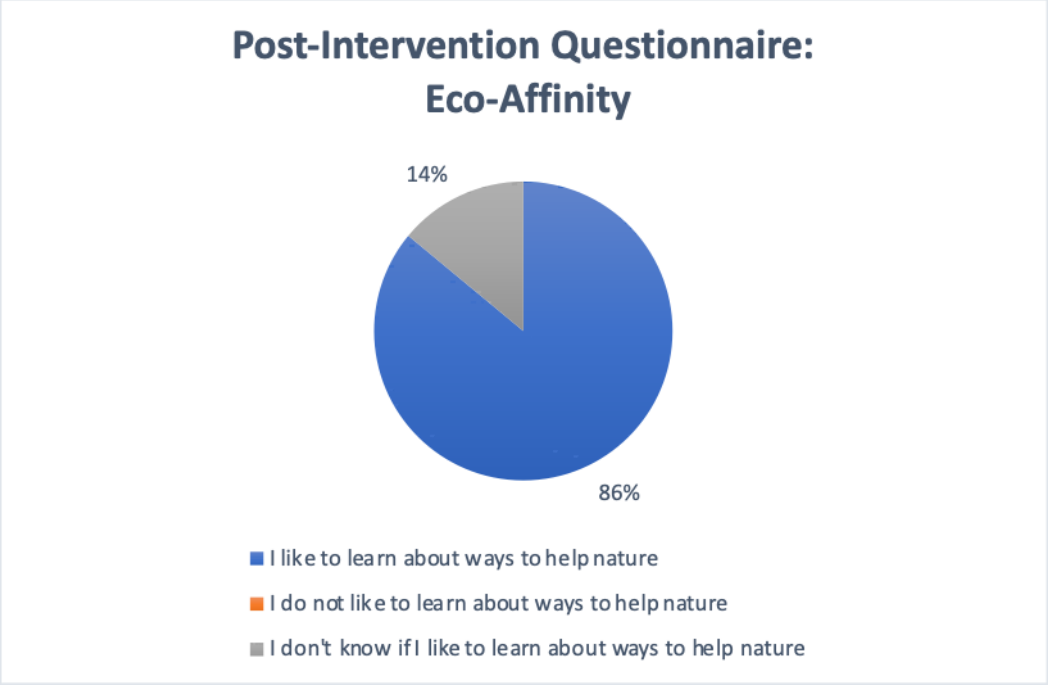

Figure 5. Post-Intervention Questionnaire Responses: Eco-Affinity

Figure 4 and 5 show a similar narrative, in which students who agreed that people need to take much better care of nature significantly increased by 40% after the intervention, reaching a unanimous agreement.

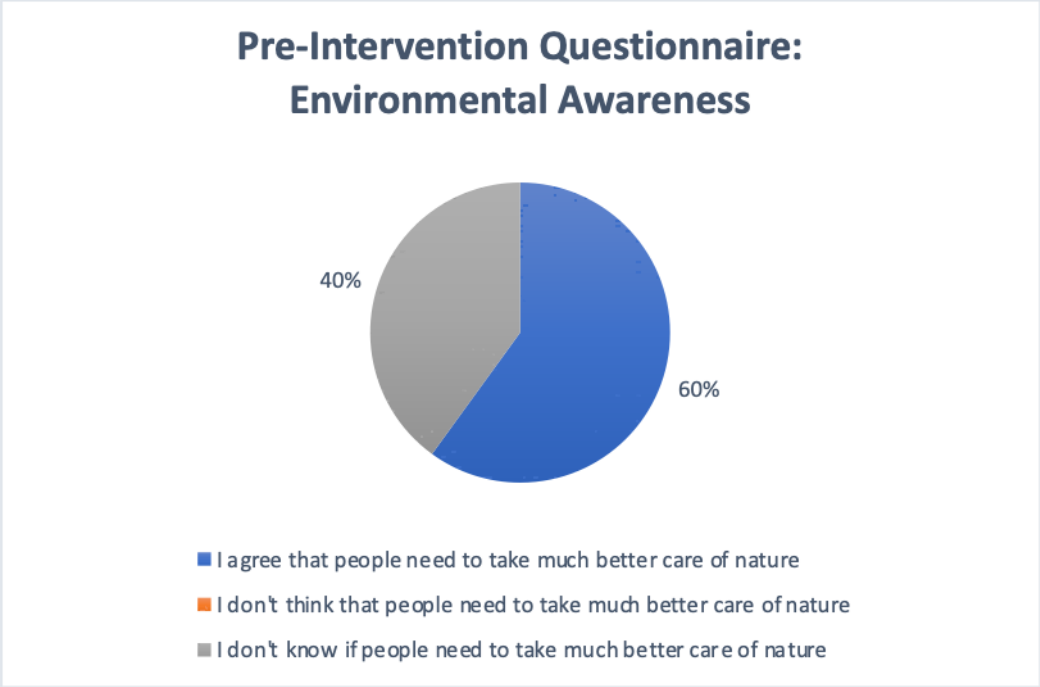

Figure 6. Pre-Intervention Questionnaire Responses: Environmental Awareness

Figure 7. Post-Intervention Questionnaire Responses: Environmental Awareness

Quantitative Component: Behavioral Tally Sheet

When analyzing behavioral tally sheet data, daily behaviors over the whole course of the intervention were totaled within their category: (1) involvement with nature, and (2) materials used. This data represents the sum of behaviors of the entire class over the span of six weeks. All behavior types were also placed into a line graph to show the pattern of behaviors over the six-week period of the action research project.

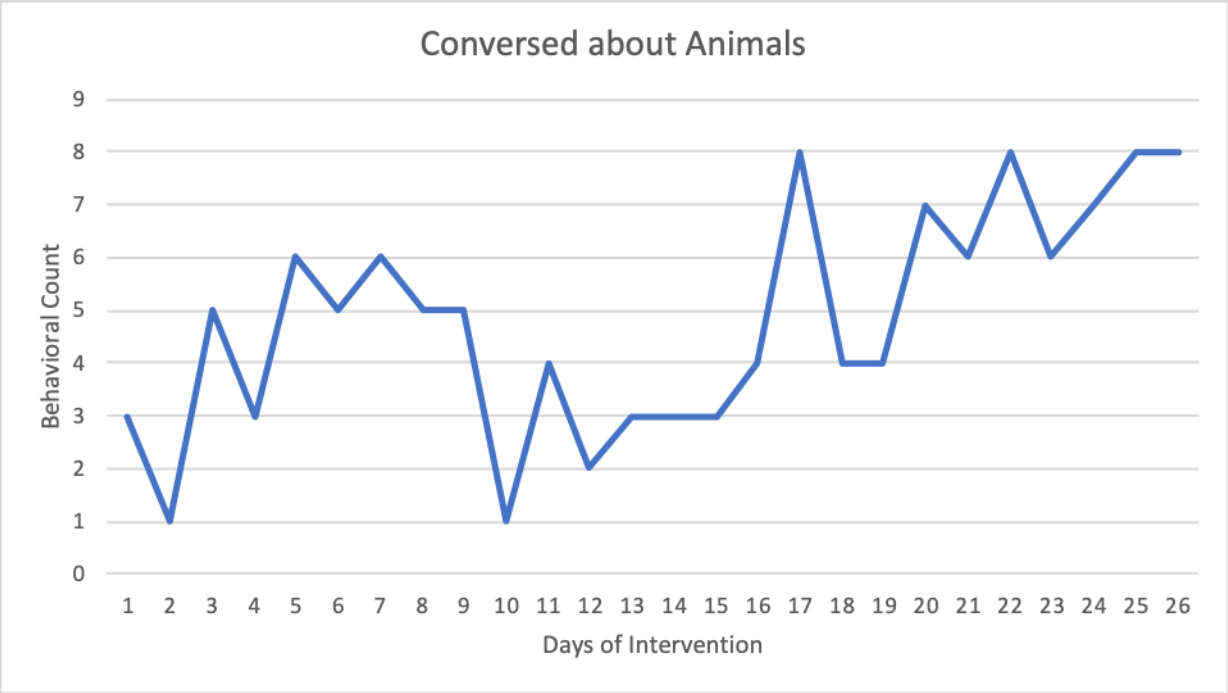

Figure 8. Frequency of students that conversed about animals throughout the intervention

Figure 8 illustrates the changes in the frequency of the behavior of students conversing about animals (CAA) over the number of days of the intervention. The conversations were either initiated by the students or other adults, not including the researcher. Each time one or more students conversed about animals, the number of tallies were recorded accordingly with respect to the number of students involved. For instance, this is how one of the nature-related conversations carried out on February 11, 2020 (16th day of the intervention):

(Student 2, 3, and 5 crowded around the two classroom parakeets, questioning why the blue bird was replaced by another green bird)
Student 3: The tail is different from the queen. It's black!
Student 5: See they can jump (Student 5 touches cage)
Wow! (Student 2, 3, and 5 touches cage gently nudging the parakeet's tail when it sticks out of the cage)
Student 2: Going in a circle, ok?
Student 5: Why are you jumping, you silly bird!
Student 3: Rainbow bird has jumped out!
Student 2: That's no rainbow fish! Look! There's a feather!
(Student 7 joins in as Student 2 and Student 3 leave for the bathroom)
Student 7: Hello, Birdy
(Student 5 moves to the toy from the top of the cage)
Student 7: How did the bird fly away if the door is closed?
Student 5: It's a magic bird! It opened the door with its beak.
Student 7: It's a mystery! A mystery! (Points up and skips outside to ask T1)

T1 later shared with the researcher that she told the students that over the winter break, the blue bird passed away due to old age and was buried in the children's garden. She and T2 prayed for it, and now the blue bird can hear the children's laughter every time they go out to play.

In the above example, the researcher recorded four tallies in the behavior conversed about animals (CAA), and four tallies in the behavior interacted with animals (IWA). Even though more conversations about the parakeet took place, the researcher was not physically there to record that data. If the conversation about an animal were to be initiated by T1 or T2 as a part of the class curriculum, then the researcher only recorded one tally for the conversation, no matter how many students were involved.

Not only does the line graph of CAA behavioral counts fluctuate toward an increasing slope (see Figure 6), but the bar graph of totaled environmentally active behavioral counts also shows a similar trend (see Figure 7).

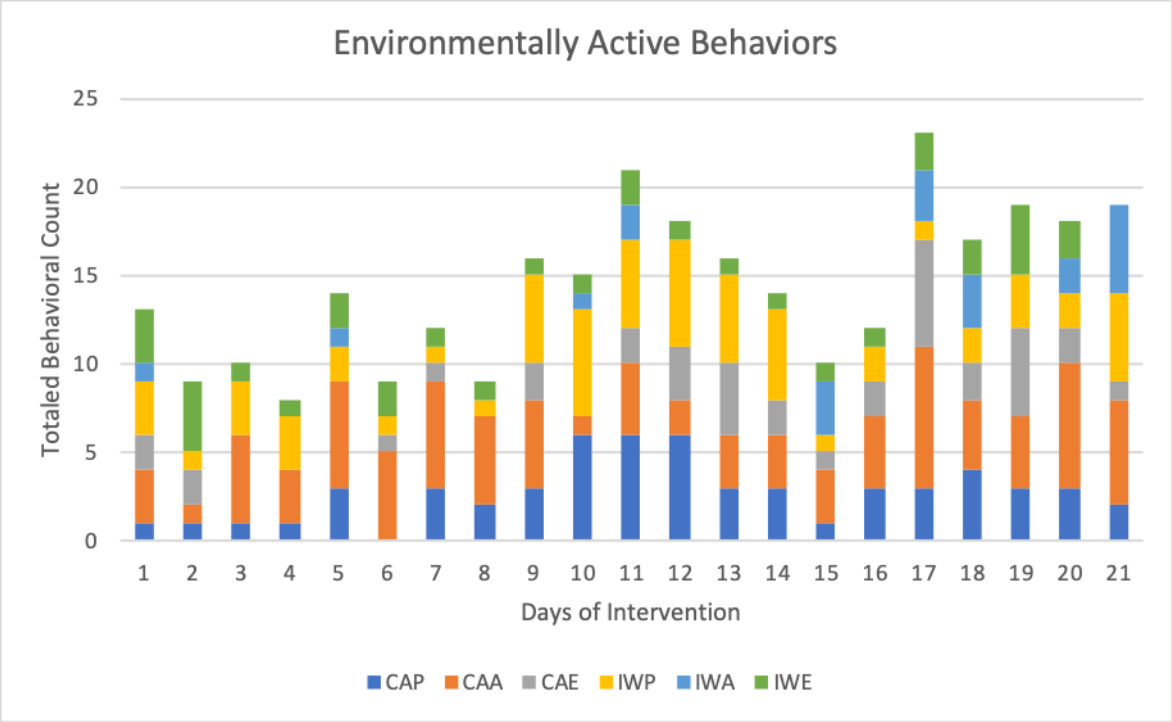

Figure 9: Total tallied behaviors and their distributions recorded throughout the intervention using the behavioral tally sheet (Appendix A). CAP = conversation about plants, CAA = conversation about animals, CAE = conversation about elements, IWP = interacted with plants, IWA = interacted with animals, IWE = interacted with elements.

In Figure 9, the daily totaled environmentally active behaviors fluctuated throughout the intervention, rising to a high point on the 11th day and from there and gradually decreasing until the 16th. The behaviors sudden peak on the 17th day of the intervention. The lowest tallies occurred on the 4th day, with only eight totaled tallies. Figure 8 details the sum of material usage in comparison to that of environmentally active behaviors throughout the 26 days of intervention. The total tallies of material usage increase as the total tallies of environmentally active behaviors increases. There is a positive correlation between the frequency of material usage and the frequency of environmentally active behaviors.

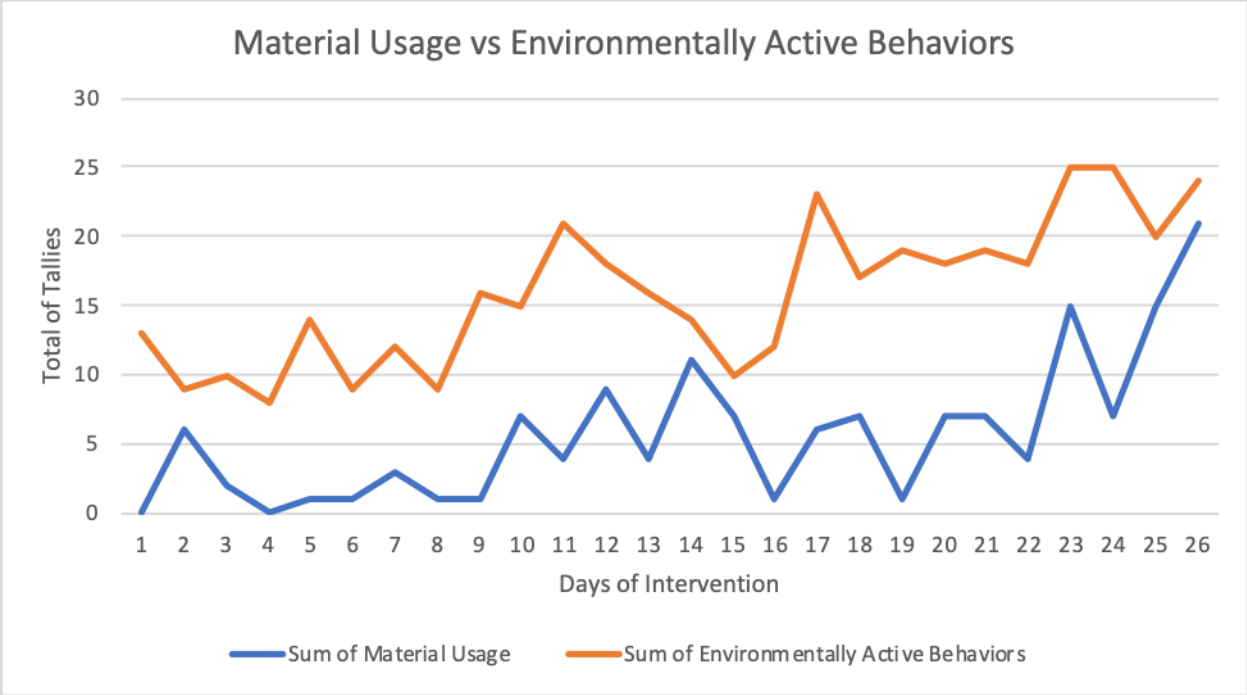

Figure 10: Daily totaled behavioral count within the categories of Material Usage and Involvement with Nature using behavioral tally sheet (see Appendix A).

Qualitative Component: Observational Notes and Field Notes

Observational notes (see Appendix B) were coded into thematic categories, then analyzed for further patterns in each category. The narrative portion of the notes, which describes student's engagement and responsiveness, was coded for any keywords or phrases that demonstrated a positive, neutral, or negative change to individual student's environmental awareness. The field notes were also coded and categorized by theme and used to give further contexts and conversational examples.

Table 2

Categorization of Repeated Themes Found in Observational Notes of Students

Category	Thematic category	Example responses
Environmentally Engaged		
EE1	**Roleplay**	**Repeatedly chanting phrases while acting**
EE2	Mental engagement	Talking about a subject
EE3 (MU)	Sensorial engagement	Interacting with a subject
EE4 (MU)	Reusing material	Making art with recycled materials
Environmentally Aware		
EA1	Curious about environment	Observing a subject closely or asking a question about a subject
EA2	Aware of recycled objects	Interacting with/Talking about recycled materials
EA3	Positive Association	Sharing that they like a natural subject OR share methods which benefits the environment
Environmentally Disengaged		
ED1	Avoiding nature	Find a subject repelling
ED2	Mistreating the environment	Pulling on a leaf or flower

Note. Mental engagement means that the observed behavior is only conversational, not sensorial. All sensorial engagements are already mental engagements by default.

The data from the observational notes (Appendix B) collected by the researcher throughout the action research period were analyzed by first sorting each entry by themes (see

Table 2). Neutral effects were coded as “environmentally engaged” (EE), positive effects in student environmental awareness were coded as “environmentally aware” (EA), and negative effects were code as “environmentally disengaged” (ED).

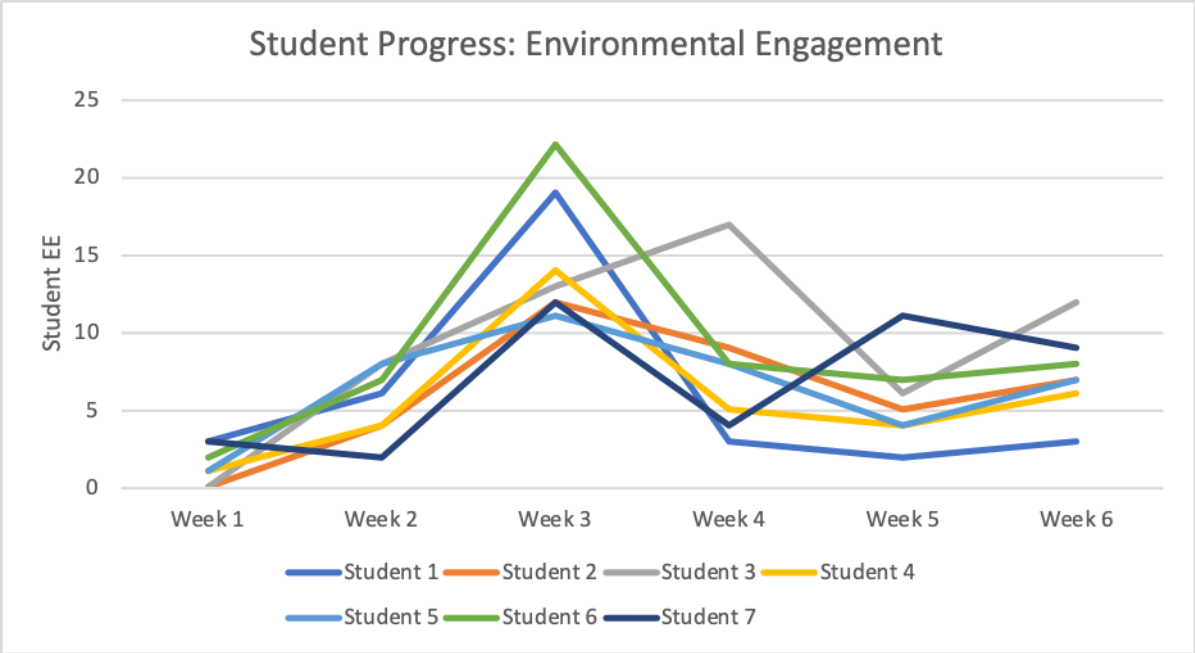

Figure 11. A line graph representing individual student progress by totaling coded students' environmental engagements (EE) derived from observational notes (see Appendix B).

As Figure 11 revealed, all students demonstrated an overall increase in EE. The overarching bell-curve of the graph in Figure 11 suggests that students EE peaked during the middle of the intervention, Week 3, with an average of 14.71 engagements and depleted during Week 2 and Week 5, both averaging at 5.57 engagements. The average during the final week of the intervention is 7.43 engagements.

As for student progress in environmental awareness, Figure 12 shows that just over half of all students, excluding Student 2, Student 3, and Student 7, demonstrated growth in EA. The average student EA reaches a low point at 1.71 signs in Week 5 but quickly recovers to the highest average point at 3.14 signs in Week 6.

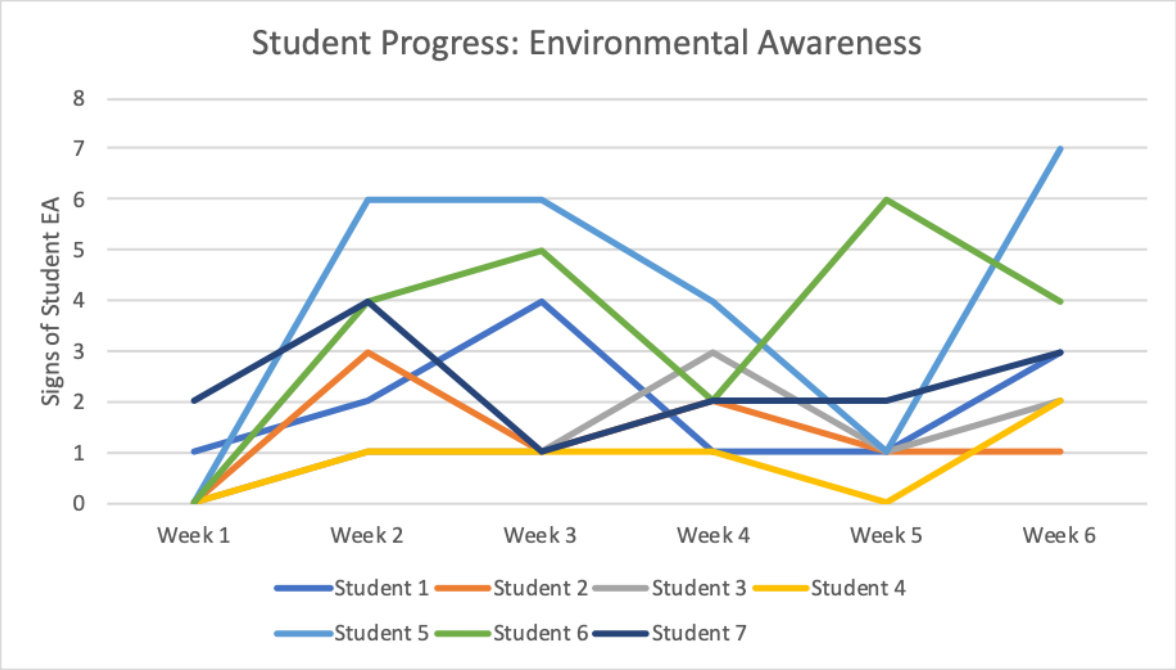

Figure 12. A line graph representing individual student progress by totaling coded signs of environmental awareness (EA) derived from observational notes (see Appendix B)

Figures 11 and 12 further suggest that environmental engagements correlated with signs of environmental awareness for Students 1, 3, 4, 5, 7, but not for Students 3 and 6. In Week 3, the class went on a nature walk, which provided an explanation for the sudden peak of observed student environmental engagements and awareness in Figures 9 and 10. In Week 5, the researcher was unable to observe for one day due to Jury Duty. This is a probable variable for the sudden drop in the total of observed students' EE and EA during that week.

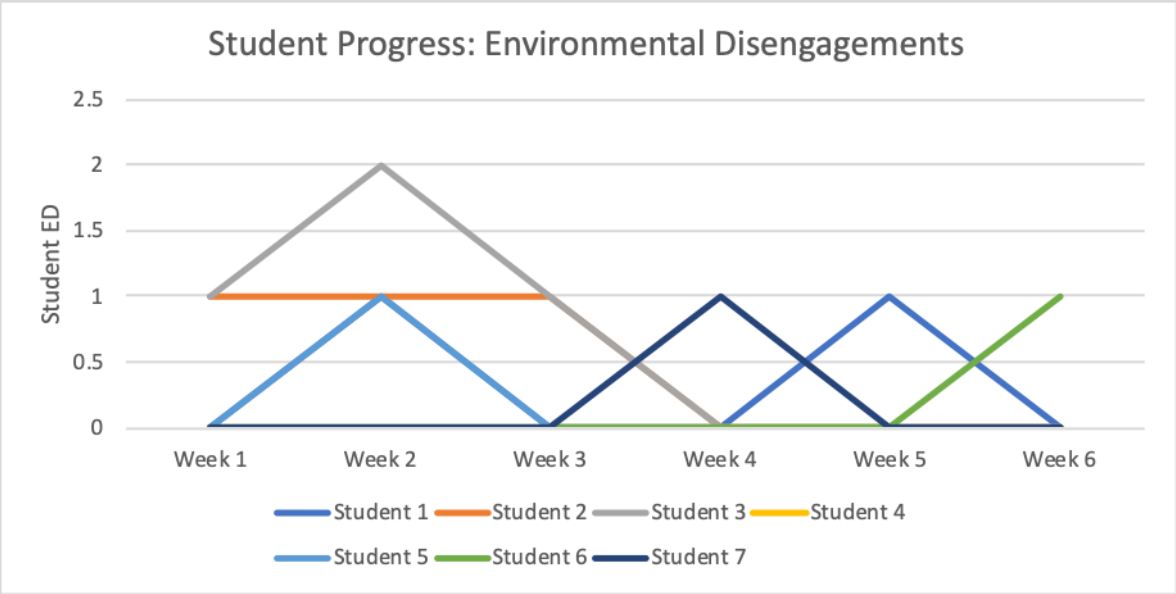

Figure 13. A line graph representing individual student progress by totaling coded environmental disengagements (ED) derived from observational notes (see Appendix B)

Figure 13 captures the few instances of student environmental disengagement. For instance, during Week 2, the researcher observed that Student 1 pulled a label out of a flowerpot in the children's garden. This action signaled that the student was not showing respect for the environment. The student ED peaks during Week 2 with an average of 0.71 disengagements, but that number quickly dropped to below 0.28 for the rest of the intervention period.

There is no sufficient evidence to suggest that there is any correlation between students' average number of observed environmental engagements with the students' average number of observed signs of environmental awareness. Student 3 interacted with nature, through roleplaying as animals, engaging in mental and sensorial activities with nature, and reusing materials, more than any other students. However, the student's environmental awareness is the second lowest (see Figure 14).

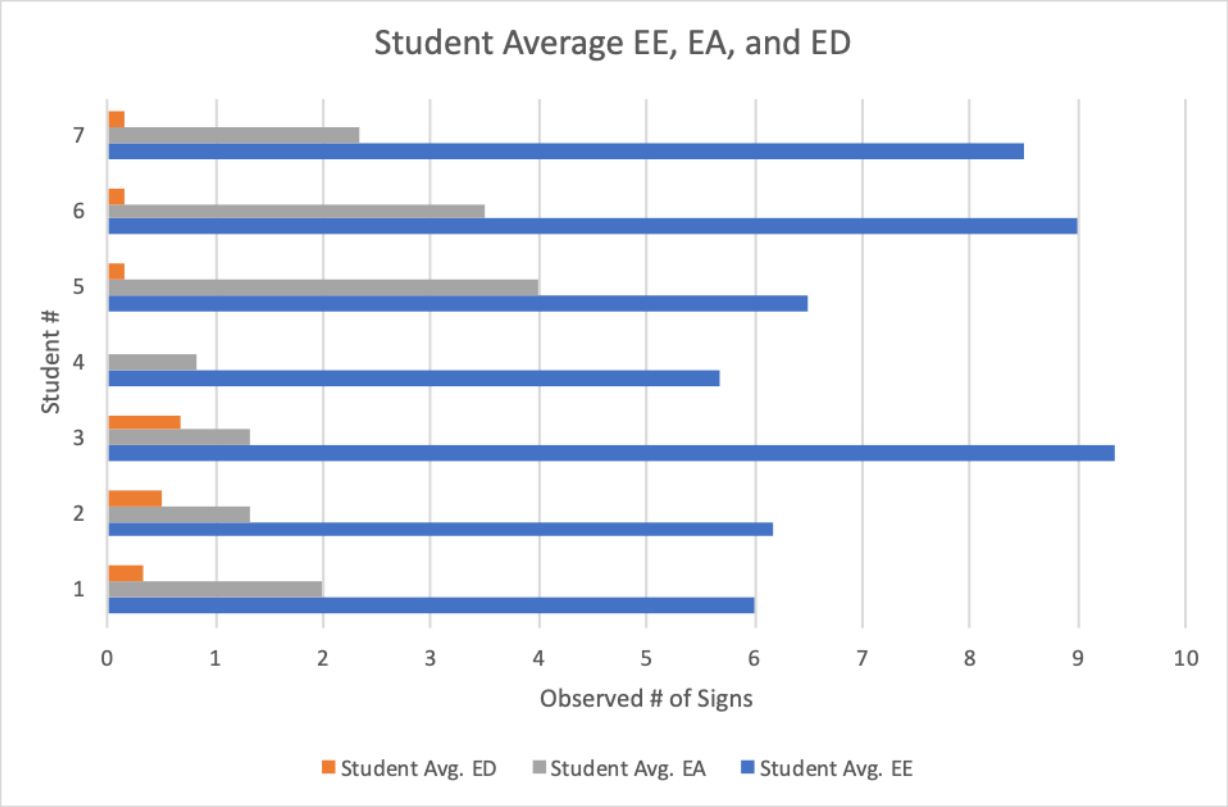

Figure 14. Comparison of average student environmental engagements and average signs of student environmental awareness

Although the data in Figure 14. showed a lack of correlation between average student environmental engagements and environmental awareness, the detailed conversations and Figure 15 demonstrated that as students work with the earth-conscious art materials, they increased their opportunities to refine their observation skills and to ask questions about the environment.

As Figure 14. revealed, Student 3 had the highest average EE, yet the lowest EA. The bar graph is the student average for the entire intervention, not weekly progress. Another explanation may be that a majority of Student 3's EE score was distributed in themes such as roleplay and mental engagement instead of in sensorial engagement and reusing materials (working with earth-conscious materials) as shown in Table 3.

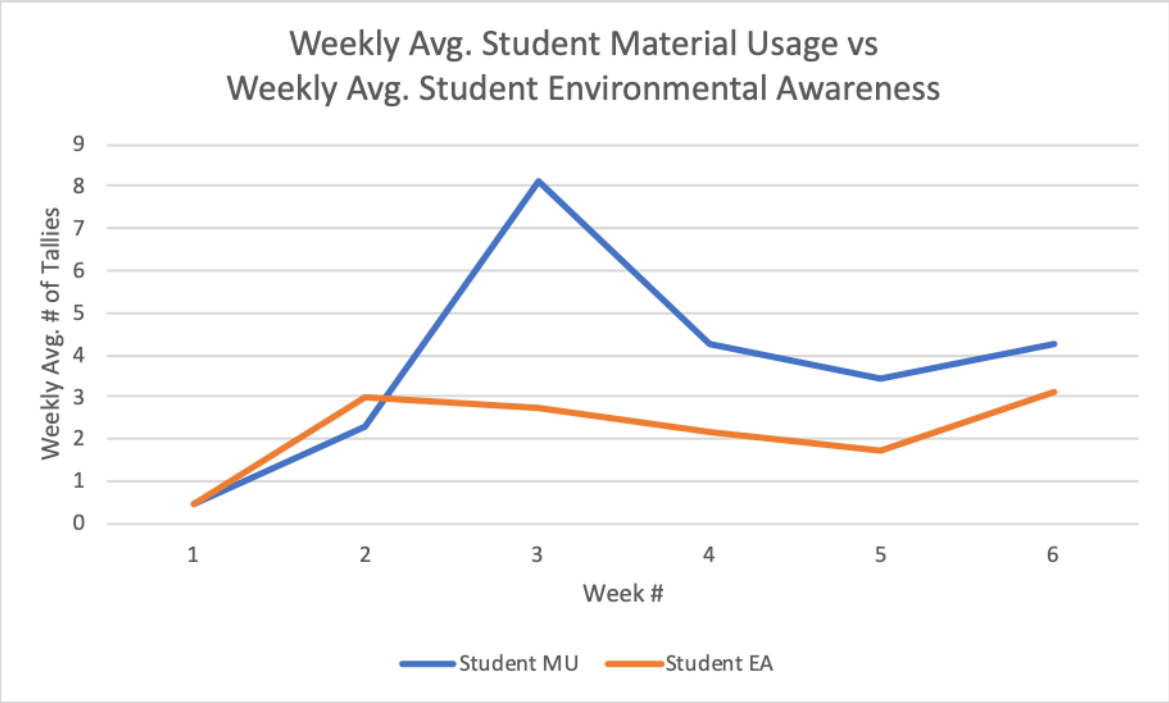

Figure 15. A line graph comparing weekly average student material usage (MU) with weekly average student environmental awareness (EA).

Figure 15 illustrates that as students work with the earth-conscious art materials, they increase their environmental awareness. The patterns show correlation between weekly average student material usage and weekly average student environmental awareness.

Table 3

Student 3's EE and EA Weekly and Total Distribution

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total
Environmental Engagement							
Roleplay	0	2	2	3	0	1	8
Mental engagement	0	2	4	6	2	4	18
Sensorial engagement	0	3	6	8	4	4	25
Reusing materials	0	1	1	0	0	3	5
Environmental Awareness							
Curious about environment	0	0	0	3	1	0	4

Table 3 shows that Student 3 became more curious about natural subjects as they became more physically involved with nature and earth-conscious art materials. They were also mistreating and avoiding nature at the beginning of the intervention (see Figure 13), which decreased as Student 3 became more physically engaged with the earth-conscious art materials. Below is a field note documentation of a conversation which occurred in Week 4:

Student 3: Ms. T3, there's a leaf!

T3: Oh, where did you notice this leaf?
Student 3: On the pad over there!
T3: Wow! Look at all the colors. Green…
Student 3: Red…
T3: What do you want to do with that leaf?
Student 3: Over here! (excitedly points their finger to the mobile, where they wanted to attach the leaf)
T3: Wow! (places next to the end of the mobile structure) What do you think?
Student 3: (notices wind blowing the mobile) It's moving!

Due to the earth-conscious art curriculum, Student 3 was noticing the natural materials in the environment. They were actively interacting with the natural materials and thinking about where it could be added to the mobile art piece, which was located in the outdoor environment. Because of the level of observation and focus involved, Student 3 was able to notice the material's interaction with other elements in the environment—the wind.

The following excerpt is another example of a conversation that occurred between two children while working with natural materials (sticks, flower petals, seeds, twine, and leaves) on a mobile.

Student 1: Looks like a crane! (picks up Student 6's work from the day before.)
Student 6: Where is that little bell from yesterday?
Student 1: Looks like a spider web.
(Later as more parts were added)
Student 1: Looks like Spiderman
Student 6: The birds are going to come!
Student 1: What about squirrels?
Student 6: They'll come too.

The interactions between Students 1 and 6 while working on the land-art mobile expanded to their conversation about animals in their immediate outdoor environment.

Several students who had been only interested in the usual activities, such as tricycles, magnet tiles, and trampoline, when playing outdoors, were later initiating work with earth-conscious art materials and caring for the outdoor environment. Furthermore,

while playing with magnet tiles, the students would converse about animals in their lives or chant a few words repeatedly, such as "Mighty Kitten! Mighty Sky, go away!"

While interacting and working with natural materials, the conversations were more in-depth, especially when adults were involved and available to scaffold and ask open-ended questions. One conversation while working with shells went as follows:

> Student 6: This one is a unicorn shell.
> Student 7: This is an oyster! Oh, there's something in here! (finds a clam that is shut tight)
> T1: What kind of animals do you think lived in there?
> Student 7: Can you open this? Maybe a mermaid? An oyster, or a crab? Or a pearl? I saw a pearl in a shell on my shirt. (after observing through the small crack for a few more seconds) There's a pearl! There's a little hole. See, it's sealed. I want to find out what is inside. I want to open it! I don't want to hurt the animal.

The above conversation demonstrated sensory and mental engagement with the clam and the heightened curiosity to learn more about the object or animal that exists inside the shell. This conversation and interaction with the shell would not have occurred without the earth-conscious art materials.

Action Plan

Using the group conversational questionnaire (Appendix C), I found that the students' mean positive eco-affinity responses increased by 16% while their mean positive environmental awareness responses increased by 23%. The data from behavioral tally sheets showed that the total tallies of environmental actions gradually increased over the six weeks period of the action project. The frequency of material usage had a positive correlation with the frequency of nature involvement. Individual students' total observed environmental actions and material usage correlated with the total of observed environmental awareness.

While conducting this research, I struggled with the categorization of which behaviors are interpreted as signs of environmental awareness. I later realized that the only way to measure

environmental awareness is by examining environmental actions since I ultimately cannot go into the minds of students. Most of the students demonstrated signs suggesting an increase in environmental awareness by interacting more with earth-conscious art materials, plants, animals, and natural elements. Several of the students showed growth in curiosity by asking an increasing number of questions about their natural environment throughout the intervention.

I would recommend this intervention be replicated over a longer period. This six-week intervention period demonstrated immediate behavioral reactions from students; however, long-lasting habitual changes need a longer research period, which brings me to my next suggestion. This intervention may be replicated over a different season. One variable that might have contributed to the positive results was the months the intervention took place. Throughout January to February, the environment was transitioning from winter to spring. As more plants and animals were becoming more responsive to the warmer weather, there was more to see in terms of germination and growth. Both children and adults were excited to be outside on warmer days. It is possible that these facts contributed to the positive results.

Another realization was how the quality of the conversations between students and adults affect the students' learning. Even though the earth-conscious materials provided more opportunities for students to talk about environmental topics, the availability of the adult and open-ended questions were vital in getting students more engaged with the topics, as opposed to merely stating facts. It is the role of the adult that ultimately made students more or less interested in such subjects. When adults ask open-ended questions, they are not a vessel for knowledge but active researchers alongside the children. They provide the tools for the children to uncover information on their own and deepen their urges to learn. Open-ended conversations

get children involved in the learning process, so they will not only be learning about their topics of interest but also learning how to learn.

Another realization was that increased environmental awareness does not suggest an increased eco affinity or ecological stewardship. A student can be more aware of the natural environment but may wish to exploit it for personal gains or consumption. That is another direction this research can be expanded upon. What kind of conversations should adults engage in to guide children towards thinking about environmental stewardship? What are the impacts of earth-conscious art materials/curriculum on students' eco affinity?

Even though this action research project led to more questions than answers, it demonstrated that by including earth-conscious art materials in the classroom environment, indoors and outdoors, educators might witness students becoming more aware of and curious about the natural wonders around them. I implore the Montessori and other educational practitioners to not only discuss the benefits of art curriculum involving nature but also to reflect critically on the environmental implications of the materials utilized in the classroom. The materials are a reflection of the school's and educator's environmental position, and by surrounding children with more sustainable and natural resources, we can start more conversations about respecting the environment and our coexistence on Earth.

References

Aguirre-Bielschowsky, I., Freeman, C., & Vass, E. (2012). Influences on children's environmental cognition: a comparative analysis of New Zealand and Mexico. *Environmental Education Research, 18*(1), 91–115. doi: 10.1080/13504622.2011.582093

Ärlemalm–Hagsér, E. (2013). Respect for nature – A prescription for developing environmental awareness in preschool. *CEPS Journal, 3*(1), 25-44.

Bidell, N. A. (2017). The affects of nature based learning on children's eco-centric attitudes, *Masters of Arts in Education Action Research Papers*.

Belz, P. (2011). Using art to teach children about themselves and the world. *Exchange, 199*, 34-36.

Bresler, L. (1993). Three orientations to arts in the primary grades: Implications for curriculum reform. *Arts Education Policy Review, 94*(6), 29. doi: 10.1080/10632913.1993.9936939

Cahnmann-Taylor, M., & Siegesmund, R. (2018). *Art-based research in education: Foundations for practice* (2nd ed.). New York, NY: Routledge.

Chang, M. (2013). Exploring natural materials in art therapy: Investigating transformative changes through creative expression with natural materials. ProQuest Dissertation and Theses.

Chawla, L. (2007). Childhood experiences associated with care for the natural world: A theoretical framework for empirical results. Children, Youth and Environments, 17, 144-170.

Chawla, L., Cushing, D. (2007). Education for strategic environmental behavior. Environmental Education Research, 13, 437-452.

Crain, W. (2000). *Theories of development: Concepts and applications* (4th ed.). New Jersey: Prentice-Hall.

Dickinson, E. (2013). The misdiagnosis: rethinking "nature-deficit disorder." *Environmental Communication, 7*(3), 315–335. doi: 10.1080/17524032.2013.802704

Doran, M. N. (2002). A broadened perspective of self, increased care for others and the earth. Available from ProQuest Dissertations & Theses Global.

Dowdell, K., Gray, T. P., & Malone, K. (2011). Nature and its influence on children's outdoor play. *Australian Journal of Outdoor Education, 15*(2), 24-35.

Eckhoff, A. (2008). The importance of art viewing experiences in early childhood visual arts: The exploration of a master art teacher's strategies for meaningful early arts experiences. *Early Childhood Education Journal, 35*(5), 463-472.

Efthymia, G., Vasiliki, G., & Konstadinos, C. (2012). Implications of the land art training for kindergarten teacher trainees on their interdisciplinary teaching practices. 1021.

Flowers, A., (2012). The effects of an art-based environmental education program on children's environmental perceptions. *University of Georgia Theses and Dissertations.*

Flowers, A., Carroll, J., Green, G., & Larson, L. (2015). Using art to assess environmental education outcomes. *Environmental Education Research, 21*(6), 846-864.

Gablik, S. (1991). *The reenchantment of art*. New York, NY: Thames & Hudson.

Horvath, C., Chambers, Patricia, Karlonas, Julie, & Sindt, Christopher. (2016). A visual arts curriculum for Montessori early childhood settings, *ProQuest Dissertations and Theses.*

Inwood, H. (2003). Creating a map for eco-art education. *Green Teacher,* 15-18.

Inwood, H. (2010). Shades of green: Growing environmentalism through art education. *Art Education, 63*(6), 33-38.

Inwood, H. (2013). Cultivating artistic approaches to environmental learning: Exploring eco-art education in elementary classrooms. *International Electronic Journal of Environmental Education, 3*(2), 129-145.

Ji-Hi Bae, N. (2004). Learning to teach visual arts in early childhood classroom: the teacher's role as a guide. *Early Childhood Education Journal, 3*(4), 247-254.

Kagan, S. (2011). *Art and sustainability: Connecting patterns for a culture of complexity.* Bielefeld: transcript Verlag.

Kernan, M., & Devine, D. (2010). Being confined within: Constructions of the good children and outdoor play in early childhood education and care settings in Ireland. *Children and Society, 24*, 371-385.

Kibbey, J. S. (1977). Curriculum and art education: An extrapolation from the Montessori doctrine. *ProQuest Dissertations & Theses Global*.

Larson, L. R., Green, G. T., & Castleberry, S. B. (2011). Construction and validation of an instrument to measure environmental orientations in a diverse group of children. *Environment and Behavior,* 43: 1, 72-89.

Lillard, A. S. (2005). *Montessori: The Science Behind the Genius*. New York: Oxford University Press.

Lillard, P. P. (1972). *Montessori: A Modern Approach.* New York: Schocken Books.

Louv, R. (2005). *Last child in the woods: why children need nature, how it was taken from them, and how to get it back.* Chapel Hill, NC: Algonquin Books of Chapel Hill.

Montessori, M. (1912). *The Montessori method.* (A.E. George, Trans.) (2nd ed.).

Montessori, M. (1913). *The advanced Montessori method vol. I.* New York: Nabu Press.

Montessori, M. (1949) *The absorbent mind.* Adyar, Madras, India: Theosophical Pub. House.

Montessori, M. (1967). *The discovery of the child*. Albany, New York: Fides Publishers Inc.

Montessori, M. (1976). *From childhood to adolescence: Including "Erdkinder" and functions of the University*. New York: Schocken Books.

Peterson, N. (1982). Developmental variables affecting environmental sensitivity in professional environmental educators. Unpublished master's thesis, Southern Illinois University, Carbondale.

Plevyak, L., & Mayfield, A. (2010). Environmental education within early childhood. *The Inclusion of Environmental Education in Science Teacher Education* 51-64. Springer, Dordrecht.

Rivkin, M. (1997). The schoolyard movement: What it is and why children need it. *Early Childhood Education Journal, 25*(1), 61-66.

Russel, C. (1999). Problematizing nature experience in environmental education: The interrelationship of experience and story. *The Journal of Experiential Education, 22*(3), 123 - 138.

Schunk, D. H. (2012). *Learning theories an educational perspective sixth edition*. Pearson.

Segalla, C., Romanyshyn, Robert, Hart, Tobin, & Selig, Jennifer. (2013). *Spirituality and its embeddedness in nature as it relates to a child's development of a sense of self,* ProQuest Dissertations and Theses.

Staples, A. F., Larson L. R., Worsley, T. E., Green, G. T., & Carroll J. P. (2019). Effects of an art-based environmental education camp program on the environmental attitudes and

awareness of diverse youth, *The Journal of Environmental Education, 50*(3), 208 - 222, doi: 10.1080/00958964.2019.1629382

Solberg, I. (2016). Land art in preschools: An art practice. *International Journal of Education & the Arts, 17*(21), 1-23.

Tarr, K. (2008). Enhancing environmental awareness through the arts. *Australian Journal of Early Childhood, 33*(3), 19+.

Tanner, T. (1980). Significant life experiences: A research area in environmental education. Journal of Environmental Education, 11, 20-24.

Temiz, Z., & Semiz, G. (2018). Combining art activities and nature in pre-school education. *Erken Çocukluk Çalışmaları Dergisi, 2*(3), 556-570. doi: 10.24130/eccd-jecs.1967201823103

Tucker, P. (2006). Curing "nature deficit disorder". *The Futurist, 40*(3), 13.

Whitaker, P. (2010). Groundswell: The nature and landscape of art therapy. In C. H. Moon (Ed.), *Materials and media in art therapy: Critical understanding of diverse artistic vocabularies* (pp. 119-135). New York, NY: Routledge.

Yohlin, E. (2012). Pictures in pictures: Art history and art museums in children's picture books. *Children's Literature in Education,* 43(3), 260-272.

York, R. A. (2014). Re-connecting with nature: Transformative environmental education through the arts. *ProQuest Dissertations & Theses Global.*

Appendix A
Behavioral Tally Sheet

Date: Start Time:_____AM/PM End Time: _____AM/PM	
Behaviors:	**Tallies**
CAP = conversed about plants	
CAA = conversed about animals	
CAE = conversed about elements	
IWP = interacted with plants	
IWA = interacted with animals	
IWE = interacted with elements	
Materials:	**Tallies**
ULSM = used land-sourced materials	
URSW = used responsibly sourced animal/plant-wastes	
UNCM = used natural construction materials	
URSM = used recycled synthetic materials	

Appendix B
Observational Notes

Observed student: _____ Age: _____ Date:_____ Start Time:_____AM/PM End Time: _____AM/PM Weather: _____ Location: _____ (15 minutes per day, 1 time per week)
Notes:
CAP = converse about plants CAA = converse about animals CAE = converse about elements IWP = interacted with plants IWA = interacted with animals IWE = interacted with elements ULSM = used land-sourced materials URSM = used responsibly sourced animal/plant wastes UNCM = used natural construction materials URSM = used recycled synthetic materials

Appendix C
Group Conversational Data Gathering Tool

Eco-affinity

I like to learn a lot about plants and animals.	No ☹	A Little ?	Yes ☺
I like to learn about ways to help the planet.	No ☹	A Little ?	Yes ☺

Environmental awareness

Plants and animals are important to people.	No ☹	A Little ?	Yes ☺
People need to take much better care of nature.	No ☹	A Little ?	Yes ☺

Artistic attitude

I like art lessons during group time.	No ☹	A Little ?	Yes ☺
I like to use natural materials like sticks and rocks to make art.	No ☹	A Little ?	Yes ☺
I like to use recycled	No	A Little	Yes

materials to make art.	☹	?	☺

Appendix D
Weekly Lesson Plan

Week 1 – Lesson 1 (15 minutes)

- Environmental artists presented: Andy Goldsworthy, Robert Smithson, and Richard and Judith Lang
- Students were asked to bring interesting materials that they considered trash and place them into the box to be reused as art. A box of paper waste for students to make collages was placed throughout the week.

– Throughout the week:

- Art shelf activities: collages
- Outdoor activities: recycled structure and paper mâché – the researcher built on the structure with students who were still interested in continuing the project and covered the sculpture with paper mâché.

Week 2 – Lesson 1 (15 minutes):

- Environmental Artist presented: Richard and Judith Lang
- Materials introduced: recycled/trash materials children brought from home. Origin: home, beach
- Students took a turn adding their decisions onto the group piece. The class discussed what it means to use recycled materials instead of throwing things away to the landfill.

– Lesson 2: (5 minutes)

- Materials introduced: glue. The researcher demonstrated how to mix flour and water to make glue and demonstrated how to create paper mâché.

– Throughout the week:

- Art shelf activities: collages
- Outdoor activities: recycled structure and paper mâché

Week 3 – Lesson 1 (15 minutes):

- Environmental Artist presented: Robert Smithson
- Materials introduced: stones/pebbles, sand, and twigs. Origin: sand/pebbles from beaches and stones from ground
- Earth Tray: Similar to a tabletop Zen garden, students were encouraged to create their own design by using the twigs to draw lines in the sand and placing rocks to make mini sculptures.
- The researcher discussed the difference between land-art and eco-art and did a three-period lesson on the two (paper mâché recycled sculpture = eco-art; rock sculpture on sand = land art).

– Lesson 2 (20 minutes): The class went on a nature walk and collected materials

from nature.

- Students were encouraged to gather twigs, leaves, flowers, and seeds.
- Students were instructed to gather materials from the ground and not from the plants to encourage environmental stewardship.
- Students were instructed on how to sort the materials in different baskets.
- Students were asked what their favorite part of the nature walk was.

– Throughout the week:

- Art shelf activities: collages, earth tray
- Outdoor activities: rocks

Week 4 – Lesson 1 (15 minutes):

- Environmental Artist presented: Andy Goldsworthy
- Materials introduced: leaves, seeds, and flowers. Origin: plants
- Class discussed ways to help plants.
- Plant Design: The researcher made a design with the new materials on the playground and invited students individually to add to the design.

– Throughout the week:

- Art shelf activities: collages, earth tray, plant tray
- Outdoor activities: rocks, leaves, flowers, twigs, seeds

Week 5 – Lesson 1(15 minutes):

- Environmental Artist reviewed: Richard and Judith Lang, Robert Smithson, and Andy Goldsworthy.
- Materials: shells, feathers, and wool. Origin: animals
- Class discussed ways to help animals.
- Animal Tray: The researcher made a design with the new materials on a tray and invited students individually to add to the design.

– Throughout the week:

- Art shelf activities: collages, earth tray, plant tray, animal tray
- Outdoor activities: rocks, leaves, flowers, twigs, seeds, shells

Week 6 – Lesson 1(15 minutes):

- Environmental Artist reviewed: Richard and Judith Lang, Robert Smithson, and Andy Goldsworthy.
- The class made a group sculpture using all earth-conscious materials (recycled materials, earth, plant, and animal materials). Students took turns adding their decisions onto the group piece. The class discussed the final product and what it means to use natural and recycled materials.

– Throughout the week:

- Art shelf activities: collages, earth tray, plant tray, animal tray
- Outdoor activities: rocks, leaves, flowers, twigs, seeds, shells, adding to the final sculpture.

Appendix E
Earth-Conscious Art Materials and the Montessori Child
Assent Form

January 14, 2020

Dear Parents,

My name is Danni Wei, and I am a St. Catherine University student pursuing a Masters of Education. As a capstone to my program, I need to complete an Action Research project. I am going to study the effects of earth-conscious art materials on primary Montessori children's environmental awareness because we aim to improve our lessons.

In the coming weeks, I will be introducing earth-conscious art materials as a regular part of my group lessons. All students will participate as members of the class. In order to understand the outcomes, I plan to analyze the results of this intervention to determine how the art activities are affecting the children's environmental awareness.

The purpose of this letter is to notify you of this research and to allow you the opportunity to exclude your child's data from my study.

> **If you decide you want your child's data to be in my study,** you don't need to do anything at this point.
>
> **If you decide you do NOT want your child's data included in my study,** please note that on this form below and return it by Tuesday, January 21, 2020. Note that your child will still participate in the activities but his/her data will not be included in my analysis.

In order to help you make an informed decision, please note the following:

- I am working with a faculty member at St. Kate's and a project coach to complete this particular project.
- The benefits may include an increase in their fine-motor skills, creativity, language development, sensorial refinement, and an appreciation for the natural environment and for art. The risks are no more than what they experience daily.
- I will be writing about the results that I get from this research. However, none of the writing that I do will include the name of this school, the names of any students, or any references that would make it possible to identify outcomes connected to a particular student. Other people will not know if your child is in my study.

- The final report of my study will be electronically available online at the St. Catherine University library. The goal of sharing my research study is to help other teachers who are also trying to improve their teaching.
- There is no penalty for not having your child's data involved in the study, I will simply delete his or her responses from my data set.

If you have any questions, please feel free to contact me, [redacted]. You may ask questions now, or if you have any questions later, you can ask me, or my instructor Olivia Christensen, [redacted], who will be happy to answer them. If you have questions or concerns regarding the study, and would like to talk to someone other than the researcher(s), you may also contact Dr. John Schmitt, Chair of the St. Catherine University Institutional Review Board, at (651) 690-7739.

You may keep a copy of this form for your records.

Danni Wei 01/14/20
Date

OPT OUT: Parents, in order to exclude your child's data from the study, please sign and return by Tuesday, January 21, 2019

I do **NOT** want my child's data to be included in this study.

_____ _____
Signature of Parent Date

Appendix F
Earth-conscious Art Materials

More Earth-conscious Art Materials

Appendix F2
Sand, Stones, and Twigs

Appendix F3
Student Works


Donation
Box


SALTINES